

ASSESSMENT OF THE EFFECTIVENESS OF TRICYCLE AS A MEANS OF PUBLIC TRANSPORTATION SYSTEM IN URBAN KATSINA, KATSINA STATE, NIGERIA

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ABSTRACT

This study assessed the effectiveness of tricycles as a means of public transportation in urban Katsina, Katsina State, Nigeria. A purposive sampling technique was employed to select the busiest tricycle terminals within the urban area. A total of 171 questionnaires were systematically administered to registered tricycle operators, while 342 questionnaires were purposively distributed to tricycle users. The data collected were analysed using both descriptive and inferential statistical methods. The findings indicated that safety, reliability, accessibility, comfort, and efficiency are the most significant service quality attributes associated with tricycle transportation in urban Katsina. Additionally, the study identified overloading and low carrying capacity as the primary challenges faced by tricycle users. Based on these findings, the study recommends that regulatory bodies, such as the Katsina State Safety and Road Traffic Authority (KASROTA) and the Federal Road Safety Corps (FRSC), should enforce appropriate sanctions on tricycle operators who violate safety regulations, particularly those involved in overloading. Penalties could include monetary fines or temporary seizure of the vehicle for a minimum of one week, to serve as a deterrent to others. Furthermore, the study suggests that the current capacity of tricycles should be upgraded to accommodate a higher number of passengers. An increase in the number of tricycles available is also recommended to enhance the overall effectiveness and efficiency of this mode of transportation within the study area.

Key words: Tricycle; Effectiveness; Operation; Transportation and Katsina

INTRODUCTION

The need for mobility is expanding rapidly across the globe. This rising demand for transportation stems from people's social and economic activities (Abdulkadir, Ubogu & Yahaya, 2021). With continuous urban growth, increasing population, and industrialization, the reliance on public transport has become unavoidable, especially in places where many families cannot afford private vehicles. Nevertheless, conventional public transport systems are unable to cope with this escalating demand, leading to the widespread rise of informal transport services worldwide (Kumar, 2011; McCormick, Mitullah, Chitere, Orero & Ommeh, 2013).

Informal public transport has become a common mode of passenger movement, especially in developing nations. Over the past thirty years, it has evolved into a vital component of urban land transport. Research highlights multiple factors behind its emergence (Shimazaki & Rahman, 2005; Ipingbemi, 2014). For example, the increasing adoption of tricycles in Nigerian cities has helped bridge the gap between the demand for and supply of public transport (Badamosi, 2007). In addition, rising per capita incomes have significantly fuelled the growing

demand for urban mobility, which conventional transport systems are unable to adequately accommodate. Other challenges such as overcrowding, poor maintenance, weak management, and limited investment in conventional public transport have further encouraged the expansion of informal transport services (Shimazaki & Rahman, 2005).

One of the most prominent forms of informal public transport is the tricycle, commonly referred to as the three-wheeler. These vehicles are designed to carry the driver along with two or three adult passengers. Typically, they feature a canvas-covered frame, a rear-mounted engine, and motorcycle-style controls. In many developing countries, tricycles have increasingly become an essential means of urban transportation, largely due to the inability of conventional public transport systems to meet the mobility needs of rapidly growing populations (Abdulkadir, Ubogu & Yahaya, 2021; Obioma, Nwaogbe & Ukaegbu, 2012; Mukhtar, Waziri, Abdulsalam & Dankani, 2015).

In Nigeria, public transportation is generally characterized by disorder, inefficiency, and inconvenience. The system is dominated by poorly regulated operators and reckless drivers who are frequently identified as major contributors to road accidents (Abdulkadir, et al., 2021). Many public transport operators exhibit indiscipline by driving on pedestrian walkways, blocking roads, and openly disregarding traffic rules and regulations. They often stop to pick up or drop off passengers indiscriminately, without designated terminals (Barau, 2003). Such practices not only disrupt traffic flow but also put the lives of pedestrians and other road users at risk. Furthermore, intense competition among operators rarely benefits passengers since the demand for public transport services continues to exceed supply (Bishop & Amos, 2015)

In Katsina metropolis, the demand for passenger transport has become increasingly complex and challenging to meet, largely due to the inadequacies of the available conventional public transport system. Even alternative modes such as motorcycles and tricycles, which serve as the dominant transport options, have been affected by issues of social exclusivity that limit their effectiveness (Abdulkadir, Ubogu & Yahaya, 2021).

Although numerous studies have examined tricycle operations in Nigeria (Adetunji, 2017; Ipingbemi & Adebayo, 2016; Zira, Ya'u & Adamu, 2017; Isaac et al., 2020; Abdullahi et al., 2024; Ismail, Adeniji & Paul, 2018), a critical gap remains. Most of these works do not specifically address the effectiveness of tricycles as a public transport system within urban Katsina. Against this backdrop, the present research seeks to investigate the operations of tricycle transport in the city, explore variations in passengers' perceptions regarding the quality of services provided, and identify the challenges faced by tricycle users in urban Katsina.

LITERATURE REVIEW

Public transport refers to transportation services accessible to the general public at regulated or subsidized fares, typically in the form of mass transit or paratransit, and distinct from private arrangements such as company or school vehicles (Rudenstine & Galea, 2012). Modes include buses, taxis, rail, motorcycles, boats, and tricycles, each with unique operational and investment characteristics. A sustainable and accessible system requires frequent, reliable, and high-quality services, complemented by pedestrian and cycling infrastructure (Jenny, 2013). Understanding passengers' behavioral intentions is also critical for operators to improve service quality, attract new users, and retain existing ones (Lai & Chen, 2010).

High-quality and affordable public transport is central to sustainable mobility and human development (Randheer, Al-Motawa & Vijay, 2011; Aidoo et al., 2013). In developing countries, the urban poor depend heavily on public transport, and its absence or inadequacy undermines livelihoods (Lorita, 2011). Dissatisfaction with service quality often pushes commuters toward private vehicles, though studies show many would shift back if public transport were more reliable (Cullinane, 2002).

Urban mobility challenges are particularly acute in developing nations, where rising demand outstrips supply. Nigerian cities such as Lagos, Ibadan, Kano, and Kaduna face persistent issues of congestion, poor roads, and vehicle shortages. To address these gaps, motorcycles and more recently tricycles have become vital alternatives, gaining popularity in both urban and rural areas as they provide affordable mobility and fill the shortfall in conventional transport supply (Abdullahi et al., 2024).

STUDY AREA

Urban Katsina is located at the extreme northern Nigeria. The city covers a total land area of about 3,370 square kilometres and is the capital city of Katsina State, which lies between 11°00' N, 6°45' E and 13° 25'N, 9°05'E. It is defined by 20km radius from the emirate council at Kofar Soro and is well connected by roads and with other regions, with an approximate distance of 155 km from Kano and 47km from Niger Republic (Aminu, 2018).

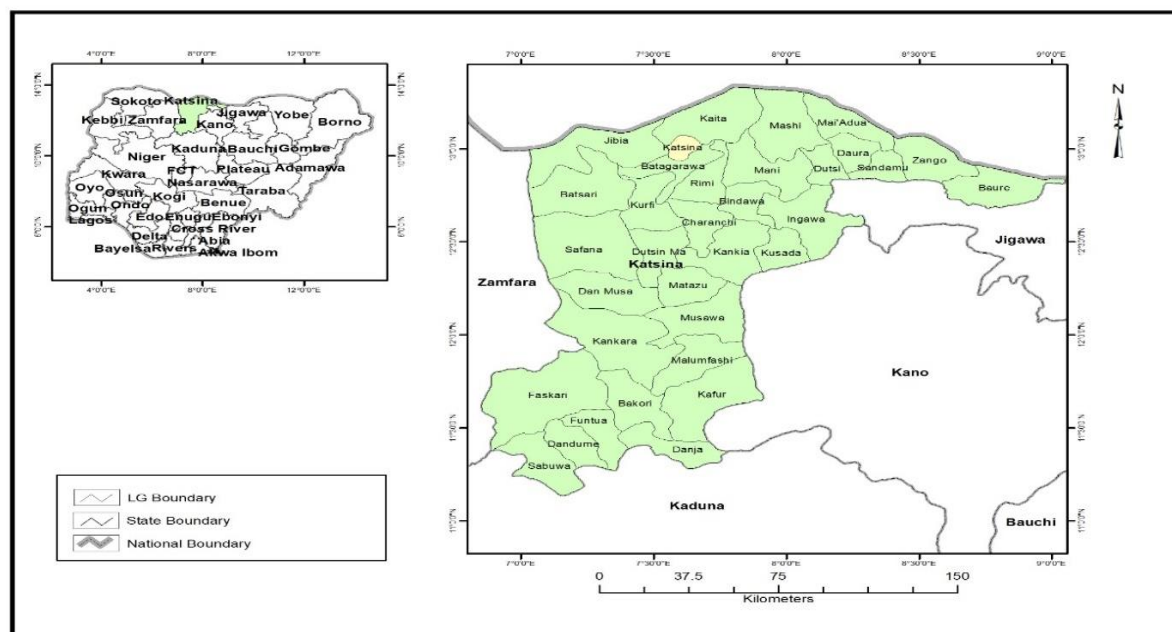


Figure 1: Katsina State Showing the Study Area

Source: Fieldwork, 2025

The climate of urban Katsina is the tropical wet and hot semi-arid type (tropical continental climate) classified by Koppen as Aw and BSh climate. Rainfall is between May and September with a peak in August. The average annual rainfall is about 700 mm. The pattern of rainfall in the area is highly variable. This can result in severe and widespread droughts that can impose serious socio-economic constraints (Abaje et al., 2012).

Urban Katsina is dominated mostly by urban activities such as residential, institutional, commercial and industrial, with some areas mostly developed for farming. Different land uses such as commercial and institutional are located within the residential area. Sabuwar Unguwa extension is the major area functioning as industrial layout. Industries such as Dana Steel Rolling Mill, Katsina Ever Glade, etc are located in this area (Aminu, 2018).

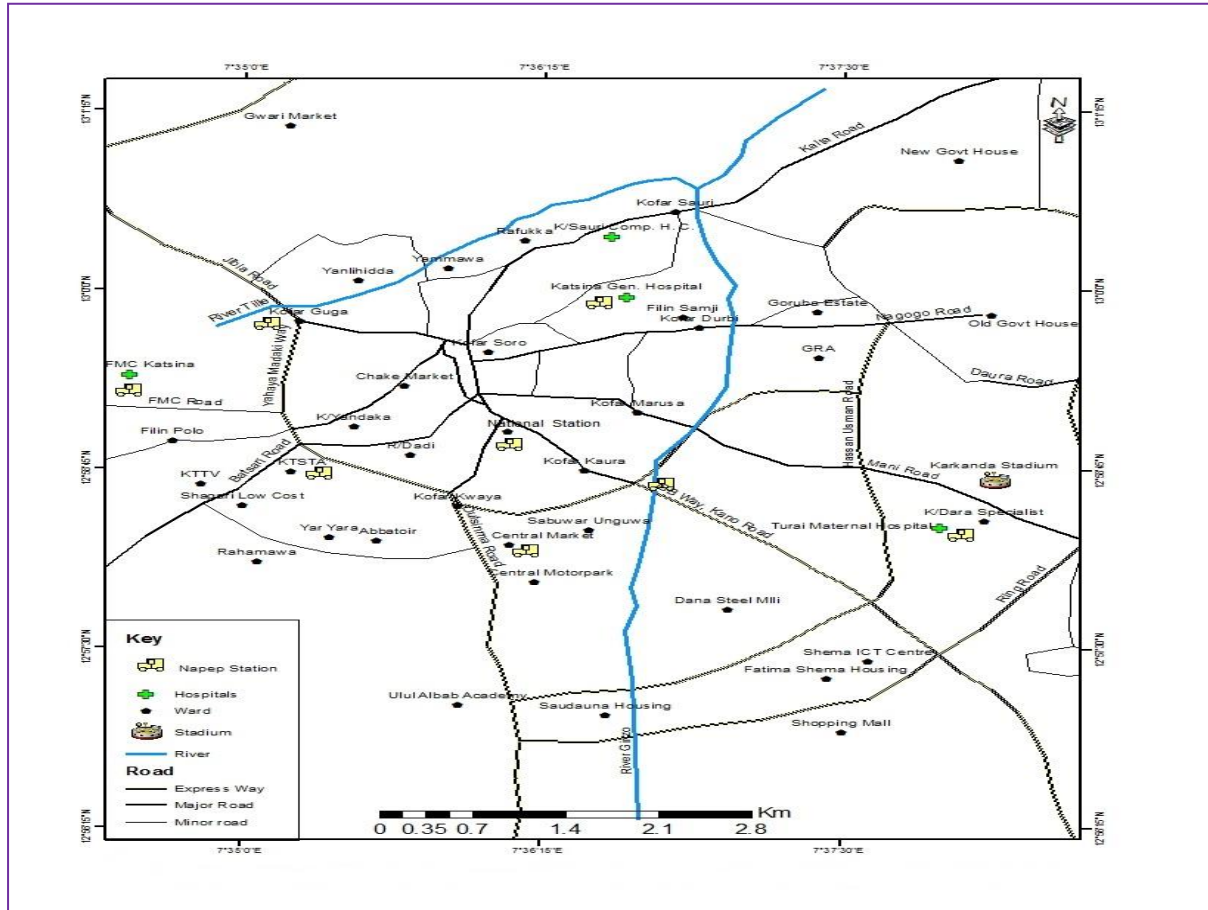


Figure 2: Busiest Tricycle Terminals of urban Katsina

Source: Fieldwork, 2025

RESEARCH METHODOLOGY

Both primary and secondary data were collected and analyzed for the study. Questionnaires were administered to tricycle operators and users at the busiest terminals in urban Katsina, identified through field observations and stakeholder consultations. The selected terminals included Kofar Kaura Roundabout, Sabuwar Tasha, Katsina State Transport Authority (KTSTA) Headquarters, Kofar Guga Roundabout, Turai Yar'adua Hospital, Federal Medical Centre, and General Hospital (See Figure 2 above).

The sample size for the study was arrived using Yamane (1967) sampling model as adjusted by Smith (1983) and cited in Zira, Ya'u and Adamu (2017) which is as thus:

$$n = \frac{N}{3+N(e)^2} \dots\dots \text{equation 1}$$

$$n = \frac{892}{3+892(0.05)^2}$$

$n = 171$

Where n = the desired sample size, N = the population size of the study area, 3 = adjusted constant value, e = level of precision (significant level).

Using the formula above, the study determined a sample size of 171 tricycle operators, based on a total population of 892 registered operators across the selected terminals. However, due to the absence of reliable data on the number of tricycle users in the study area, a 2:1 ratio (i.e., two tricycle users for every one operator) was adopted in selecting respondents across the busiest terminals, as presented in Table 1 below.

Table 1: Distribution of questionnaire by Terminals

SN	Terminals	Capacity	Questionnaires distributed by terminals	
			Operators	Users
1	Kofar Kaura roundabout	150	29	58
2	KTSTA Headquarters	140	27	54
3	Kofar Guga roundabout	135	26	52
4	National	120	23	46
5	Sabuar Tasha	110	21	42
6	Turai Yar'adua Hospital	90	17	34
7	Federal Medical Center	75	14	28
8	General Hospital	72	14	28
Total		892	171	342

Source: Fieldwork, 2025

A systematic sampling technique was employed to administer questionnaires to tricycle operators. Every fifth operator in the loading queue was selected; if the fifth operator was unavailable, the next available operator was approached, and the count restarted. This process continued until the allocated number of questionnaires for each terminal was completed. Tricycle plate numbers were recorded to prevent duplication. For tricycle users, a purposive sampling technique was adopted.

Descriptive and inferential statistical techniques were used to analyse the data collected from the field. The Data obtained were coded for analysis using Statistical Package for Social Science (SPSS) version 23.0 and Microsoft excel 2013.

RESULTS AND DISCUSSIONS

Gender of Respondents

The analysis in figure 3 revealed that 100% of tricycle operators were males. This indicates that tricycle operation is mainly for men in the study area. This could be attributed to the fact that urban Katsina is predominantly a conservative Hausa-Fulani Muslim society that prevents women from engaging in transport operation. This is in line with the finding of Yahaya and Malik (2019) assertion that the household structure in Katsina State reflect Hausa cultural household hierarchy in which females participate less in public social activities. On the users' side, 24.9% of the respondents were males while 75.1% were females.

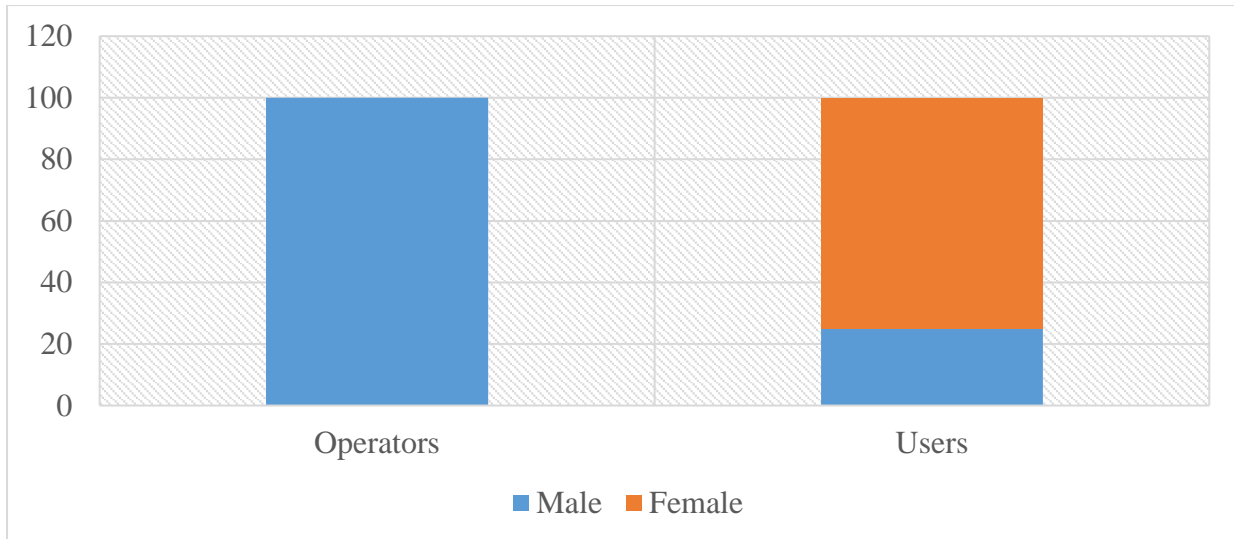


Figure 3: Gender of Respondents

Source: Fieldwork, 2025

This is a clear indication that females patronize commercial tricycle more than their male counterpart in urban Katsina. This could be attributed to the fact that majority of the married women in urban Katsina were prevented from using commercial motorcycle which is the only available means of public transport in the city after tricycle. The result of this analysis is similar to the finding of Adeyemi and Yusuf (2019) in Ifo Local Government area of Ogun State, which reported that females patronize tricycle more than their male counterpart.

Age of Respondents

The age bracket of tricycle operators varied from 20years to 54years where the age group 25-29 and 30-34 contributed the highest number of respondents 22.2% and 20.5% respectively. On the other hand, the age bracket of tricycle users varied from 15years to 60years of age where the age group 30-34 contributed the highest number of respondents 20.2%, followed by the age group 25-29 which contributed 19% (Figure 4). This analysis indicates a young distribution of respondents in both operators and users who are assumed to be active, agile and vibrant and willing to take up job in numerous activities which is the characteristics of these age groups.

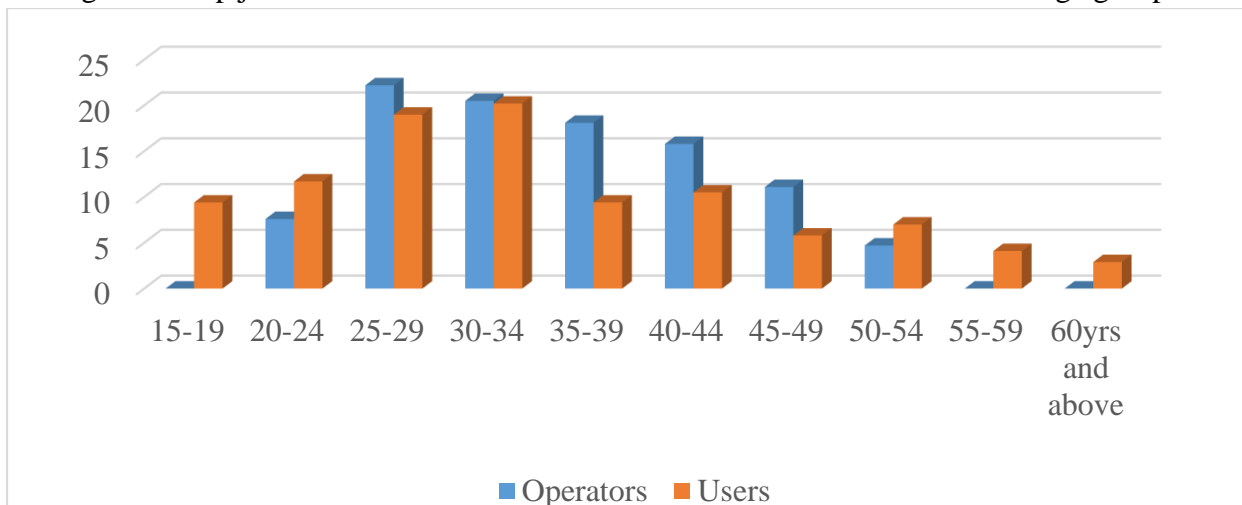


Figure 4: Age of Respondents

Source: Fieldwork, 2025

Marital Status of Respondents

The result also shows that 50.9% of tricycle operators were single, 46.8% were married while the remaining 1.2% were divorced and 1.2% were separated. On the users' side, 70.5% of them were married (Figure 5). This implies that married people patronize tricycle more than the other marital status class in the study area and make more trips than other marital status class. This could be attributed to the fact that married people need to move around in searching for one opportunity or the other for the purpose of meeting their daily needs and to provide for their household. Further analysis shows that 23.1% of tricycle users were single while the remaining 5.3% and 1.2% were divorced and widows/ widowers respectively. Correlating the age distribution and the marital status of both users and operators, this finding is in line with the work of Yushau, Ubogu and Mamman, (2021) where they explained that early marriage is still common among the people of Katsina state.

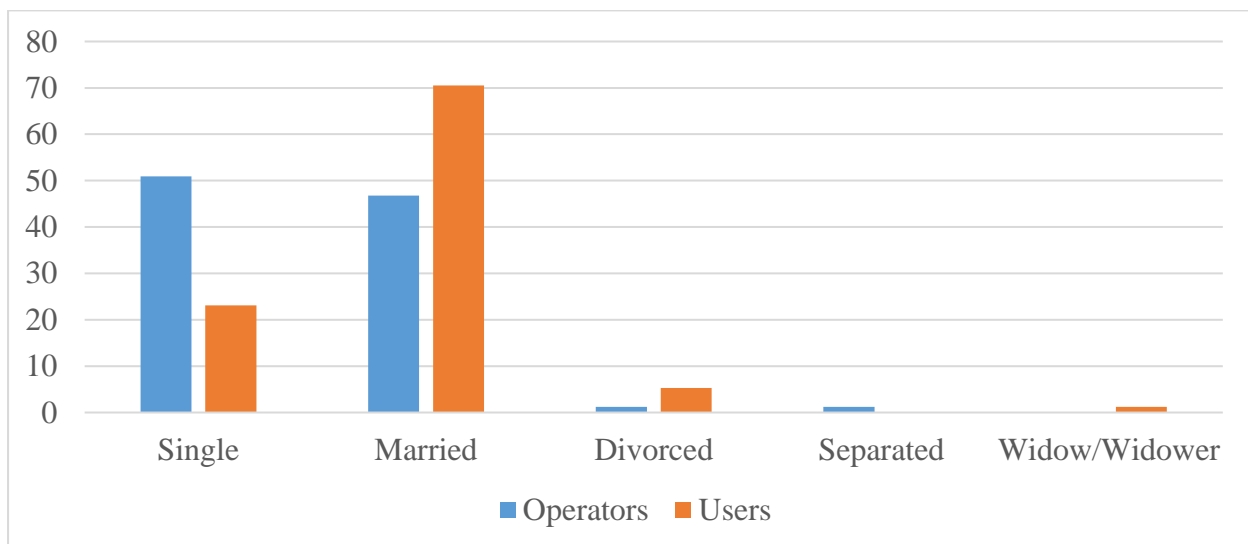


Figure 5: Marital Status of Respondents

Source: Fieldwork, 2025

Education Level of respondents

The analysis in figure 6, reveals that majority of tricycle operators in the study area 49.75% obtained Senior Secondary, 30.4% have none formal education, 11.1% obtained Tertiary education and the remaining 4.7% and 4.1% obtained junior secondary and primary education respectively. On the user's side, 64.6% obtained tertiary education. This implies that the passengers were knowledgeable enough to provide information on their perceptions of the quality of service rendered by tricycle public transport in urban Katsina. Further analysis revealed that 21.6% obtained Senior Secondary education, 11.7% have None Formal education while the remaining 2% obtained Primary education.

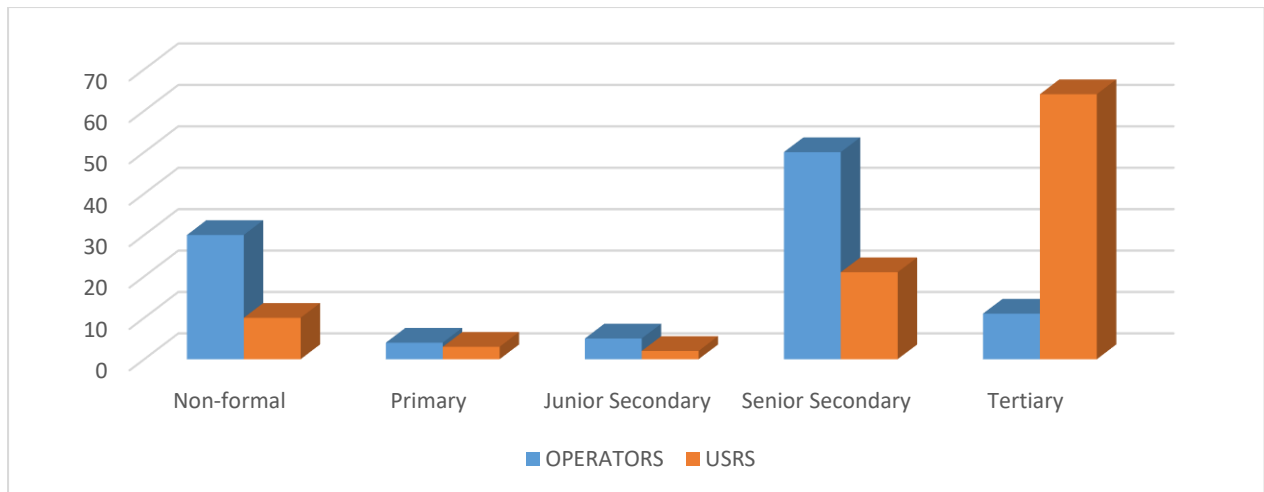


Figure 6: Education Level of Respondents

Source: Fieldwork, 2025

Routes of Operation

The result in table 2, shows that 100% of tricycle operators agreed that they do not have routes which they must operate their vehicles on. This finding indicates that tricycle operators can follow everywhere in urban Katsina depending on the availability of passengers along the routes, nature of the routes, low traffic congestion or personal choice of the tricycle operators. The resultant effect of this finding is that tricycles compete on roads with other vehicles in heavy traffics and this result in traffic delay and congestions. Corroborating this, Ogunsemoyin, Kabir and Isyaka, (2019) in Kano metropolis revealed that tricycles ply both primary and secondary roads and can follow everywhere in the city and this resulted in traffic delay and congestion on many routes in the city.

Table 2: Routes of Operation

Category	Frequency	Percent
Yes	0	00.0
No	171	100
Total	171	100

Source: Fieldwork, 2025

Days of Operation

Figure 7 below, shows days of operation of tricycle in urban Katsina. The result revealed that 97.7% of the respondents operate their tricycles every day of a week, while the remaining 2.3% responded that they normally operate their tricycle for six days in a week because of the church service on Sundays. This analysis indicates that tricycles were accessible in urban Katsina as majority of the operators function every day of a week.

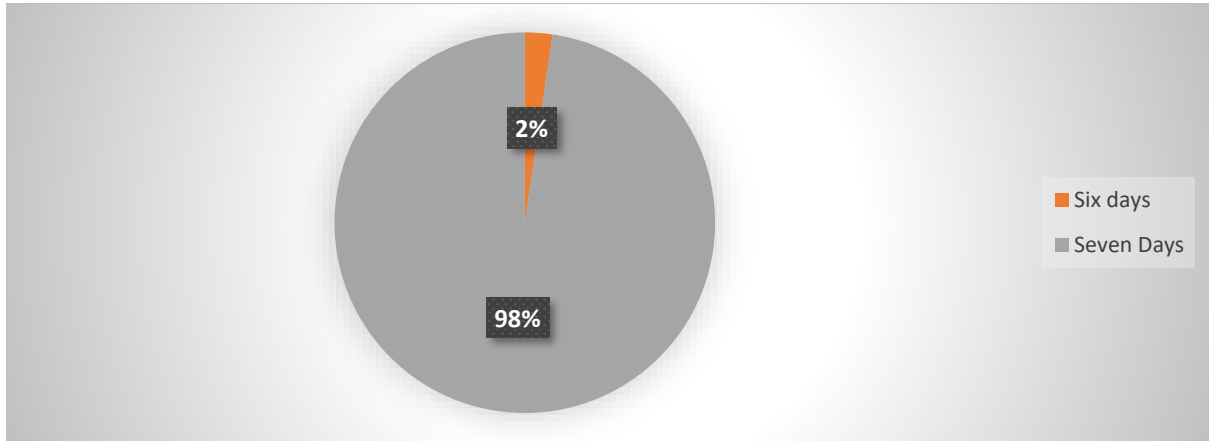


Figure 7: Days of operation

Source: Fieldwork, 2025

Average Hours of Operation

From the analysis in table 3 below, it is revealed that about half of the respondents 49.7% responded that they work for 10-12 hours daily. Some of the operators expressed that 10-12 hours operation reduces so many unhealthy incidences as most crimes are often perpetuated in the night. This is in disagreement with the finding of Isaac, Habila, Opara and Akpaka, 2020 which revealed that majority of tricycles operators in Minna functions between 7-9 hours daily. Further analysis shows that 24.6% function for 7-9 hours while the remaining 15.2% responded that they operate their tricycle for more than 12 hours in a day while the remaining 10.5% function for only 4-6 hours daily.

Table 3: Average Hours of operation per day

Category	Frequency	Percent
4- 6 hours	18	10.5
7- 9 hours	42	24.6
10- 12 hours	85	49.7
Above 12 hours	26	15.2
Total	171	100

Source: Fieldwork, 2025

Users' Perception of Various Service Quality Attributes of Tricycle Public Transport System in Urban Katsina

The public transport service quality attributes considered in this study are safety, speed, comfort, affordability, accessibility, reliability and efficiency. Similar method was adopted by Ismail, Adeniji & Paul (2018) in the Assessment of Tricycles Operations as an Alternative Means of Urban Transport in Lokoja, Kogi State. One way analysis of variance (ANOVA) was carried out to test for significant differences between users' perception of the various service quality attributes of tricycle in the study area.

Table 4: Test of Homogeneity of Variances

	Levene Statistics	df1	df2	Sig.
Safety	3.801	1	340	.052
Speed	2.907	1	340	.063
Comfort	.176	1	340	.675
Affordability	.326	1	340	.569
Accessibility	.498	1	340	.481
Reliability	.011	1	340	.918
Efficiency	.859	1	340	.355

Source: Fieldwork, 2025

Levene test was carried out to check for the assumption that the variances are not significantly different. The result in table 4 above, shows that the Levene test is not significantly different on safety ($p=.052$), speed ($p=.063$), comfort ($p=.675$), affordability ($p=.569$), accessibility ($p=.481$), reliability ($p=.918$) and efficiency ($p=.355$). The analysis indicates that the assumption of equal variances is not violated, therefore, the data is suitable to carry out One Way ANOVA.

Table 5: One Way ANOVA

		Sum of Squares	Df	Mean Square	F	Sg.
Safety	Between Groups	6.097	1	6.097	9.861	.002
	Within Groups	210.245	340	.618		
	Total	216.342	341			
Speed	Between Groups	.176	1	.176	.247	.620
	Within Groups	241.719	340	.711		
	Total	241.895	341			
Comfort	Between Groups	3.048	1	3.048	7.037	.008
	Within Groups	147.291	340	.433		
	Total	150.339	341			
Affordability	Between Groups	2.078	1	2.078	3.593	.059
	Within Groups	196.673	340	.578		
	Total	198.751	341			
Accessibility	Between Groups	7.337	1	7.337	9.238	.003
	Within Groups	270.057	340	.794		
	Total	277.395	341			
Reliability	Between Groups	7.149	1	7.149	9.394	.002
	Within Groups	258.769	340	.761		
	Total	265.918	341			
Efficiency	Between Groups	1.923	1	1.923	4.346	.038
	Within Groups	150.451	340	.443		
	Total	152.374	341			

Source: Fieldwork, 2025

The result of the ANOVA is presented in table 5 above. The analysis of the ANOVA result reveals that there is significant different in respondents' perception on safety $F(1,340)=9.861$, $p=.002$; comfort $F(1,340)=7.037$, $p=.008$; accessibility $F(1,340)=9.238$, $p=.003$; reliability $F(1,340)=9.394$, $p=.002$ and efficiency $F(1,340)=4.346$, $p=.038$. Furthermore, the result shows that speed and affordability are not significantly different, $p>0.05$.

This analysis indicates that safety, reliability, accessibility, comfort and efficiency are the most significant variables in terms of service quality attributes of tricycle in urban Katsina according to tricycle users. This is in line with the findings of Dike (2012) which reveals that safety, comfort, efficiency and reliability were of uppermost consideration among tricycle users in Nigerian cities. The analysis further reveals that speed and affordability are insignificant variables in terms of quality attributes of tricycle public transport system in urban Katsina. This is not surprising because of the relationship that exist between speed and accidents. Corroborating this, Tailor (2017) reveals that high speed increases the likely hood of an accident.

Challenges Encountered by Tricycle Public Transport Users in Urban Katsina

The passengers of tricycles public transportation system in urban Katsina have been confronted with problems such as safety problem; delay; high fare; inadequate tricycle service; harassment from law enforcement agents and low speed. Low carrying capacity; over loading and gender segregation are also included. The analysis in table 6 below, shows that 26.9% of tricycle users opined that over loading was the major problem of using tricycle in the study area. This is in disagreement with the findings of Ismail, Adeniji and Paul, 2018 which revealed frequent stop over as the major problem of using tricycle in Lokoja.

Table 6: Challenges encountered by tricycle public transport users in urban Katsina

Problems	Frequency	Percent
Safety problem	14	04.1
Delays	25	07.3
High fare	32	09.4
Inadequate tricycle service	21	06.1
Harassment from law enforcement agents	15	04.1
Low speed	36	10.5
Low carrying capacity	44	12.9
Over loading	92	26.9
Bad attitude of riders	30	08.8
Not mixing genders	33	09.6
Total	342	100

Source: Fieldwork, 2025

Further analysis showed that low carrying capacity accounted for 12.9% of the problems affecting tricycles users in urban Katsina. Low speed was another problem of using tricycle in urban Katsina. It accounted for 10.5%. On the other hand, harassment from law enforcement

agents and safety problems ranked the least of the problems of using tricycle public transport system in the study area 4.4% and 4.1% respectively (See Table 6 above).

Solutions to the Challenges Encountered by Tricycle Public Transport Users in Urban Katsina

The result in table 7 below, shows the passengers opinions on how the challenges of using tricycle public transport system in the study area can be minimized upon. The analysis revealed that 35.7% of the passengers suggested provision of adequate public transport service. This could be as a result of the absence of other means of public transport such as big buses, mini buses and taxi services in urban Katsina.

Table 7: Solutions to the challenges encountered by tricycle public transport users

Solutions	Frequency	Percent
Provision of adequate public transport service	122	35.7
Provision of infrastructural facilities	68	19.9
Fare reduction	88	25.7
Mixing genders	40	11.7
Training of drivers	24	07.0
Total	342	100

Source: Fieldwork, 2025

Further analysis shows that 25.7% agreed on fare reduction, 19.9% suggested provision of infrastructural facilities, while the remaining 11.7% suggested that training of drivers will improve tricycle public transport system in the study area. Supporting this, Olorunfemi (2013) affirm that if drivers of public transport are well sensitized and educated about traffic rules and regulations, it will go a long way in reducing public transport problems in Nigerian cities.

CONCLUSION AND RECOMMENDATIONS

The study establishes that the tricycle public transport system constitutes a major mode of urban mobility in the study area. Findings revealed that safety, reliability, accessibility, comfort, and efficiency are the most critical service quality attributes associated with tricycle transportation in urban Katsina. However, overloading and limited carrying capacity were identified as key challenges faced by users.

Despite these issues, the majority of commuters who patronize tricycles believe that the provision of an adequate public transport system within the city, alongside fare reductions, would significantly mitigate these challenges. Given the widespread reliance on tricycles for urban mobility, it is imperative that the system be properly regulated to ensure the continued provision of safe, reliable, and efficient transport services to city residents.

Based on the findings, the study recommends that regulatory agencies such as the Katsina State Road Traffic Authority (KASROTA) and the Federal Road Safety Corps (FRSC) enforce strict penalties against tricycle operators found guilty of overloading. Sanctions may include monetary fines or the temporary seizure of the vehicle preferably for a minimum of one week as a deterrent to non-compliance.



Furthermore, it is recommended that the current tricycle capacity be upgraded to accommodate more passengers. An increase in the number of operational tricycles is also necessary to enhance the overall effectiveness of this transport mode within the study area.

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